![OptiProERP Manufacturing]

# BUSINESS CASE FOR SMART FACTORY IN SMB MARKETS

## Competing in a new landscape

# Abstract

The fourth industrial revolution or Industry 4.0 as commonly known, is emerging as a new business model disrupting the way manufacturers manage and control day to day operations. The incursion into a more sophisticated model has enabled early adopters – mainly large multinational corporations – to support production efficiency, productivity, and flexibility; thus, providing these firms a competitive advantage by means of cost reduction and higher customer satisfaction. Prior to the COVID-19 pandemic, SMB companies have been slow to embrace this transformation primarily discouraged by critical barriers which have been perceived to outweigh any potential benefits. As the pandemic evolved exposing supply chain fragilities, workforce scarcity and changes in customers buying preferences, it also uncovered how unprepared small companies were to quickly respond to unprecedented market conditions. Many of the challenges remain, as larger companies are on track with their I4.0 initiatives and therefore increasing demand for connected value systems across all the supply chain, of which SMB companies are part of, the paradigm among many is starting to change. This paper provides insight into the main benefits Smart Factory can trigger for small and medium manufacturing businesses as they adapt this new reality.

# Introduction

According to Thramboulidis (2015) and Lee et al. (2015), "in Industry 4.0, the application of connected and embedded systems with software solutions makes it possible to control and monitor production through the processing and analysis of information extracted from the production process." Although the scope of any Industry 4.0 initiative encompasses interconnectivity between people, machines, processes, and technology, both internally and externally, with all the different stakeholders throughout the supply chain. And other concepts such as augmented reality, digital twins, additive manufacturing, etc. The primary purpose of the Smart Factory suite of functionalities rests on three distinct areas: Manufacturing Execution System, IIoT, and Production Scheduling.

A recent study on the manufacturing industry's 2023 outlook by Deloitte states increased interest among manufacturers to invest in technologies as part of a risk mitigation and growth strategy. This was in response to the challenges faced throughout the pandemic as the supply chain was stressed, markets evolved, and the workforce started to shrink. It became apparent that companies with greater digital maturity could navigate such challenges and adapt to the changes in the marketplace coming from vendors, employees, and customers alike. The most critical strategic trends identified are: 1) investment in advanced technologies, 2) talent management, 3) supply chain visibility and resilience, 4) smart factory initiatives, and 5) sustainability for corporate responsibility.

The need for a solution such as Smart Factory has become evident as part of a holistic approach toward digital transformation. Small and medium-size manufacturers compete in an increasingly interconnected world, experiencing rapid changes where agility and productivity are more critical than ever. To face this reality, companies are searching for specialized partners to help in their journey. Eworkplace Manufacturing, the parent company of OptiProERP, has a unique opportunity to provide such guidance. Our Smart Factory solution, paired with extensive knowledge of the manufacturing environment, both process and discrete, allows for an offering ready to address these critical challenges.

# Smart Factory Suite
# MES



Gartner defines MES as follows: "MES is a specialist class of production-oriented software that manages, monitors, and synchronizes the execution of real-time physical processes involved in transforming raw materials into intermediate and/or finished goods. These systems coordinate the execution of work orders with production scheduling and enterprise-level systems like ERP and product life cycle management (PLM). MES applications also provide feedback on process performance and support component and material-level traceability, genealogy, and integration with process history, where required".

One of the primary goals of Industry 4.0 initiatives is the support of decision-making by providing real-time visibility to available data from the manufacturing process.  To support this goal, the Smart Factory MES module centers on three areas within the Shop Floor:

1. Asset Management
2. Workforce Management
3. Shop Floor Execution

# Asset Management

According to Aberdeen Strategy and Research, the average cost per hour of downtime as of 2016 is approximately $260,000 across all businesses. Up 60% since 2014[1] . The International Society of Automation concluded that 5% to 20% or up to 33% of productivity could be lost due to unnecessary downtime. Even if SMB organizations don't experience this cost level, the financial impact on the bottom line is still significant. Delayed orders and quality issues mount up to rework/returns, inciting customer dissatisfaction and an erosion of trust. Studies show that 91% of dissatisfied customers will not do business with a brand that failed to meet their expectations.[2]  An automated tracking system can dramatically reduce downtime by monitoring machine performance, job changeover, and employee errors. Smart Factory provides functionalities to address these risks.

As it pertains to machines, tools, and gauges, shop floor asset management can be separated into several performance categories: availability, stability, and usage. Smart Factory MES reports on all three. Aided using asset dashboards, managers can see individual resource's status by location and work center. Workloads are recorded as work orders are synchronized from either ERP or the Scheduling module. Notifications are triggered automatically when thresholds are not met or instability is detected according to specified parameters. Planned or manual downtimes can be input and reflected when a machine is unavailable due to scheduled maintenance or failure.

[1] https://www.aberdeen.com/blogposts/stat-of-the-week-the-rising-cost-of-downtime/

[2] https://customerthink.com/10-need-to-know-customer-dissatisfaction-stats

# Workforce Management

The US Chamber of Commerce noted in a recent study that there are more than 1.5 Million unfulfilled jobs in the manufacturing industry. It also estimated that 3 million adults went into early retirement during the pandemic and haven't returned to work. Access to skilled productive labor is at an all-time low. Increased labor accidents are another stressor. The US Bureau of Statistics estimates that Manufacturing accounted for 15 percent of all private industry nonfatal injuries and illnesses in 2019. Furthermore, according to BusinessWire, poorly trained workers were responsible for 23% of unplanned downtime. Per the US Labor Department, labor productivity fell 7.5%, and wages increased more than 11% during the 2022 first quarter. The 2023 Manufacturing Industry Outlook by Deloitte states one of the trends to watch: "Upskilling and reskilling: As the use of digital technologies proliferates across the manufacturing sector, the workforce increasingly needs advanced technical and digital skills. However, skilled workers are in short supply in the manufacturing industry. Manufacturers will likely emphasize reskilling strategies, including continuous training to upskill the workforce". Smart Factory contributes to this goal.

The workforce management module incorporates timesheets, resource allocation, process protocols, and a customizable training app. This feature supports both management and team member levels. Management dashboards are designed to give performance intelligence on attendance, occupation, productivity, and availability. Alerts are triggered by set parameters with full integration to the Microsoft Teams platform or through internal system messaging and email. Operators can input clock-in, break clock-out times, and start, pause, and finish hours for every work order they attend. Process protocols provide safety, work, and material handling instructions, thus enabling standardization in the execution of all production orders, diminishing machine downtime risk, quality pitfalls, material waste, and employee accidents. The embedded LMS manages required training, exams, certifications, and any other necessary knowledge transfer, all tailored to the team member's profile, position, or task execution demands.

# Shop Floor Execution

Managing machines and workforce, designing well thought out plans while adhering to a strict schedule, controlling physical inventory movements all along carefully complying with corporate governance and financial controls are paramount tasks impossible to achieve without automation tools at the shop floor level. This functionality synchronizes people, processes, machines, raw materials, and technology to achieve overall visibility into the entire production process as part of a value chain.

Shop floor execution manages the production process for all work orders released and ready for fabrication. From raw material consumption and operation tracking to finished goods receipt to inventory and label printing. Fully integrated with ERP systems, the information from the floor flows automatically, guaranteeing inventory movements and costs are reflected on the backend as they occur. With a responsive design, managers and operators can access the application through any desktop, mobile, or handheld device, making it easy to record, verify and approve transactions directly on the shop floor.

The data from all modules come together to feed the business intelligence dashboards available as part of the application. Performance indicators, machine status, resource productivity, yields and outputs, and OEE gauges are some of the built-in widgets readily accessible. Capabilities also include an analytical designer for more personalized information display and reporting. The goal is to support production managers on different fronts. It allows for rapid response to exceptional events, focuses on critical resources, and helps manage the production process more efficiently. Cost benefits can be attained through waste reduction, resource usage optimization, and minimizing human errors by providing process instructions on all essential tasks.

# IIOT

Industrial operations rely on optimal conditions to function efficiently, outcomes become unpredictable if early anomaly detection is not set in place. All of the variables within the manufacturing location have functionalities that contribute to the output in one way or another. Cyber-physical systems, called sensors/controllers, collect a wealth of information as they gather input from their source and the surrounding environment.

When integrating "smart industrial devices" into an analytical application, many things come into play. Among them: 1) device location, 2) connectivity, 3) device characteristics, 4) device technology, and 5) user type.[3] Smart Factory industry-standard communication protocols fetch data from those devices into the application. Its database serves as the central repository to transform data into insight. The business intelligence engine analyzes and presents essential device performance to stakeholders within the production process. Real-time information grants agility to respond proactively to out-of-the-ordinary events, detecting anomalies as they happen and permitting fast action.

[3] (Boyes, Hallaq, Cunningham, & Watson, 2018)

# Production Scheduling

Supply chain disruptions, labor shortages, and changing market conditions have all accentuated the need for a pragmatic approach to production scheduling. Constraints inside and outside the organization make it difficult to adhere to customer timelines in a timely, cost-beneficial manner without specialized tools that look at all variables and plan according to material and resource availability.

Advanced Planning & Scheduling (APS) offers several benefits:

● Inventory reduction. It allows the optimized purchase of raw materials and the reduction of semi-finished products, synchronizing supplies to a feasible production plan. Such precise results lead to a 50% reduction in raw material and WIP stock.

● Productivity increase. APS provides scheduling rules that allow for setup minimization, load balancing parallel machines, and pegging of components and materials. These features and many others account for the historical 25% plant productivity improvement.

● Improved customer service. Accurate scheduling results in an average 80% improvement in on-time deliveries, improving the customer's perception of commitment and reducing contractual penalties for delays.

# Conclusions

According to the SBA, 98.6% of manufacturing companies are small businesses. 25% of which have more than 20 employees. These companies generated 32.9% of the United States $1.3 trillion dollar exports. The manufacturing industry as a whole contributes 24% of the total GDP. The manufacturing sector has experienced a 1.9% growth over the past 25 years.[4] It is expected to grow faster due to manufacturing facilities returning to America. It is estimated that 4 in 5 companies are reshoring due to supply chain disruptions, geopolitical conflicts, and high tariffs.[5] The landscape for SMBs in the manufacturing industry is looking promising.

Digital transformation becomes imperative as companies compete in a new normal. Flexibility, agility, and efficiency come hand in hand at a moment when value systems are expected from all stakeholders of the ecosystem. Although ERP applications are a great start, they need more specialized functionalities for more in-depth management and analysis of all things related to a manufacturing facility. Competitive advantage is attained by organizations that have adopted Industry 4.0 initiatives and proven to be more resilient and responsive to ever-changing customer needs. In its curve to maturity, technological advances put information for decision-making at the forefront of strategic investments as a means to customer retention, market penetration, and innovation with better profit margins and enhanced corporate responsibility. Smart Factory and the manufacturing expertise offered by Eworkplace Manufacturing is a powerful combination to bring part of Industry 4.0 initiatives to fruition for SMB manufacturing industries.

[4] Manufacturing Industry Statistics – NIST 2021

[5] Made in America: these are some of the companies bringing manufacturing back to the US. Business Insider. https://www.businessinsider.com/made-in-america-companies-bringing-manufacturing-back-to-us-2022-7

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